

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re continuation application of )  
CHARLES F. CHUBB, JR. ET AL )  
Serial No. 576,849 )  
Filed: February 3, 1984 )  
TITLE: WARPED PLANE PHASED ARRAY )  
MONOPULSE RADAR ANTENNA )

Before the Examiner:  
T. Blum  
Group Art Unit: 222

Commissioner of Patents and Trademarks  
Washington, D. C. 20231

Sir:

PRELIMINARY AMENDMENT

IN THE CLAIMS

Please cancel claims 1-5, and add new claims 6-10 as follows:

1. In a phased array, phase-amplitude monopulse radar system,  
a radar subsystem comprising:

a phased array antenna including a plurality of  
substantially horizontal rows of radiating elements disposed in  
phased-relationship to one another;

said plurality of substantially horizontal rows of  
radiating elements being maintained in a predetermined  
relationship along a vertical axis with a top and bottom  
horizontal row, each of said horizontal rows having a

I hereby certify that this correspondence is  
being deposited with the United States Postal  
Service as REGISTERED mail in an envelope  
addressed to: Commissioner of Patents and  
Trademarks, Washington, D. C. 20231, on

1-23-87

Donna L. Tanasi  
Signature

January 23, 1987  
Date

5

10 horizontal perpendicular sensitivity direction in a horizontal plane making a horizontal acute angle with respect to a boresight line;

1 feed means for coupling radiation to and from said phased array antenna, said feed means including sum and difference  
15 feed means for coupling respective sum and difference monopulse information from said phased array antenna to a signal processing means for interpreting radar return signals; and

2 a plurality of phase shift means connected directly to said rows of radiating elements for controllably modifying the phase  
20 of electromagnetic energy coupled from said feed means to each of said horizontal rows of said phased array antenna; characterized in that:

each of said top and bottom rows of said phased array antenna is set with a corresponding horizontal sensitivity  
25 direction on opposite sides of said boresight line and forming a diverging acute angle with respect thereto;

at least two intermediate rows of said plurality of horizontal rows are set with monotonically varying intermediate angles of said horizontal sensitivity directions, whereby said  
30 difference monopulse information contains both elevation and azimuthal difference information.

27. A radar system according to claim <sup>1</sup>/<sub>6</sub>, further characterized in that said plurality of substantially horizontal rows of radiating elements are disposed in a non-planar vertical array, each horizontal row making an acute horizontal row angle in a horizontal plane with respect to said boresight direction and being substantially perpendicular to said horizontal sensitivity direction, whereby said sensitivity directions correspond to mechanical angular differences in the disposition of said horizontal rows.

38. A radar system according to claim <sup>1</sup>/<sub>6</sub>, further characterized in that said plurality of substantially horizontal rows of radiating elements are disposed in a substantially planar array and further characterized in that said feed means feeds each of said horizontal rows with radiation in a predetermined horizontal phase gradient corresponding to a desired horizontal sensitivity direction.

49. A radar system according to claim <sup>2</sup>/<sub>7</sub>, further characterized in that said phase shift means comprises a set of a single phase shift element for each of said plurality of horizontal rows.

*1*  
*Bill*  
*5-*  
*3*  
10. A radar system according to claim ~~8~~, further characterized in that said phase shift means comprises a set of a single phase shift element for each of said plurality of horizontal rows.

---

REMARKS

Claims 1-5 have been cancelled and replaced by claims 6-10 in order to point out more clearly the invention. Note that claim 6 is in Jepson format pointing out the improvement with respect to the prior art. As can readily be seen, the improvement is not merely having two or more antennas with different angles. Substitution of the antenna of Torby or Grabowski in Steudel does not meet the limitations of the claims, nor is there any suggestion of the limitations.

The rejection of all claims in the parent case under 35 USC 103 over Steudel in view of either Torby or Grabowski is respectfully traversed.

The references cited by the Examiner do not even combine to form the preamble of Applicants' Jepson claim 6. Steudel shows a generic radar system, but his phase shifters 34 are not only switched between an output amplifier and a preamplifier but there is a phase shifter for each radiating element. The